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ONTARIO WATER
RESOURCES COMMISSION

ANNUAL REPORT 1965

ELORA

water pollution control plant

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E467
W38
1965

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DIVISION OF PLANT OPERATIONS

Ontario Water Resources Commission

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ONTARIO WATER RESOURCES COMMISSION

OFFICE OF THE GENERAL MANAGER

Members of the Elora Local Advisory Committee,
Village of Elora.

Gentlemen:

I am pleased to provide you with the 1965 Annual Report for the Elora Water Pollution Control Plant, OWRC Project No. 62-S-125.

We appreciate the co-operation you have extended to our Operations staff throughout the year, and trust that continuation of this close association will ensure even greater progress in the sphere of water pollution control.

Yours very truly,

D. S. Caverly,
General Manager.

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ONTARIO WATER RESOURCES COMMISSION

801 BAY STREET

TORONTO 5

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VICE-CHAIRMAN

D. S. CAVERLY
GENERAL MANAGER

W. S. MacDONNELL
COMMISSION SECRETARY

General Manager,
Ontario Water Resources Commission.

Dear Sir:

I am pleased to provide you with the 1965 Annual Report on the operation of the Elora Water Pollution Control Plant, OWRC Project No. 62-S-125.

The report presents design data, outlines operating problems encountered during the year and summarizes in graphs, charts and tables all significant flow and cost data.

Yours very truly,

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

FOREWORD

This report provides useful information on the operating efficiency of this project during 1965. It is intended to act as a guide in gauging plant performance. To implement that aim, it includes detailed statistical and cost data, a description of the project and a summary of its operation during the year.

Of particular interest will be the cost data, which show the total cost to the municipality and the areas of major expenditure.

The Regional Operations Engineer is primarily responsible for the preparation of the report, and has compiled and arranged the material. He will be pleased to answer any questions regarding it. Other groups, however, were involved in the production, and these include the statistics section, the Drafting Section of the Division of Sanitary Engineering and the Division of Finance.

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

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ELORA

water pollution control plant

operated for

THE VILLAGE OF ELORA

by the

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DIVISION OF PLANT OPERATIONS

DIRECTOR: B. C. Palmer

Assistant Director: C. W. Perry
Regional Supervisor: D. A. McTavish
Operations Engineer: B. W. Hansler

801 Bay Street Toronto 5

'65 REVIEW

An estimated total of 13.111 million gallons of sewage were treated during the year at a total cost of $6,679.39 The operating cost per million gallons and the cost per pound of BOD removed were $509.45 and $0.32 respectively.

The estimated average daily flow for 1965 was 35,000 gallons. During the year one-half the design flow of 83,300 gpd was exceeded 27 percent of the time.

The average raw sewage BOD and suspended solids concentrations of 182 ppm and 269 ppm varied from the design values of 210 ppm and 250 ppm respectively. Although the average effluent BOD and suspended solids of 21 ppm and 44 ppm respectively exceeded the OWRC objects of 15 ppm for each, the BOD and suspended solids were below the OWRC objectives during the later part of the year. The earlier less efficient operation was experienced during the plant start-up and stabilization period.

Under supervision by head office engineers, the chief operator has operated a clean, attractive and efficient plant for the Village of Elora.

GLOSSARY

BOD	biochemical oxygen demand (a measure of organic content)
cfm	cubic feet per minute
comminution	shredding of solids into small fragments
DWF	dry weather flow
effluent	outflow
flocculation	bringing very small particles together to form a larger mass (the floc) before settling
fps	feet per second
gpcd	gallons per capita per day
gpm	gallons per minute
grit	sand, dust, stones, cinders and other heavy inorganic material
influent	inflow
lin. ft.	lineal feet
mgd	million gallons per day
mlss	mixed liquor suspended solids
ppm	parts per million
ss	suspended solids
TDH	total dynamic head (usually refers to pressure on a pump when it is in operation)

HISTORY
1961 - 1965

INCEPTION

In 1961, the Village of Elora and the Ontario Water Resources Commission initiated plans for the construction of a modern water pollution control plant and for the installation of sanitary sewers.

The firm of R. V. Anderson and Associates, Toronto, Consulting Engineers, was engaged to prepare plans and specifications for the project.

APPROVAL

Ontario Municipal Board approval for this project was issued on September 23, 1963 and on October 3, 1963, the Village signed an agreement with the Ontario Water Resources Commission to finance, construct and operate the project.

CONSTRUCTION

The contracts were awarded to Pearce Construction Company Limited of Hagersville, Ontario and Johnson Brothers Company Limited of Brantford, Ontario for the construction of the sanitary sewers and the sewage treatment plant respectively. Construction of the sewage plant and the sanitary sewers was substantially completed in November 1964 and September 1964 respectively.

The plant start-up date was September 28, 1964.

TOTAL COST

$361,945.68

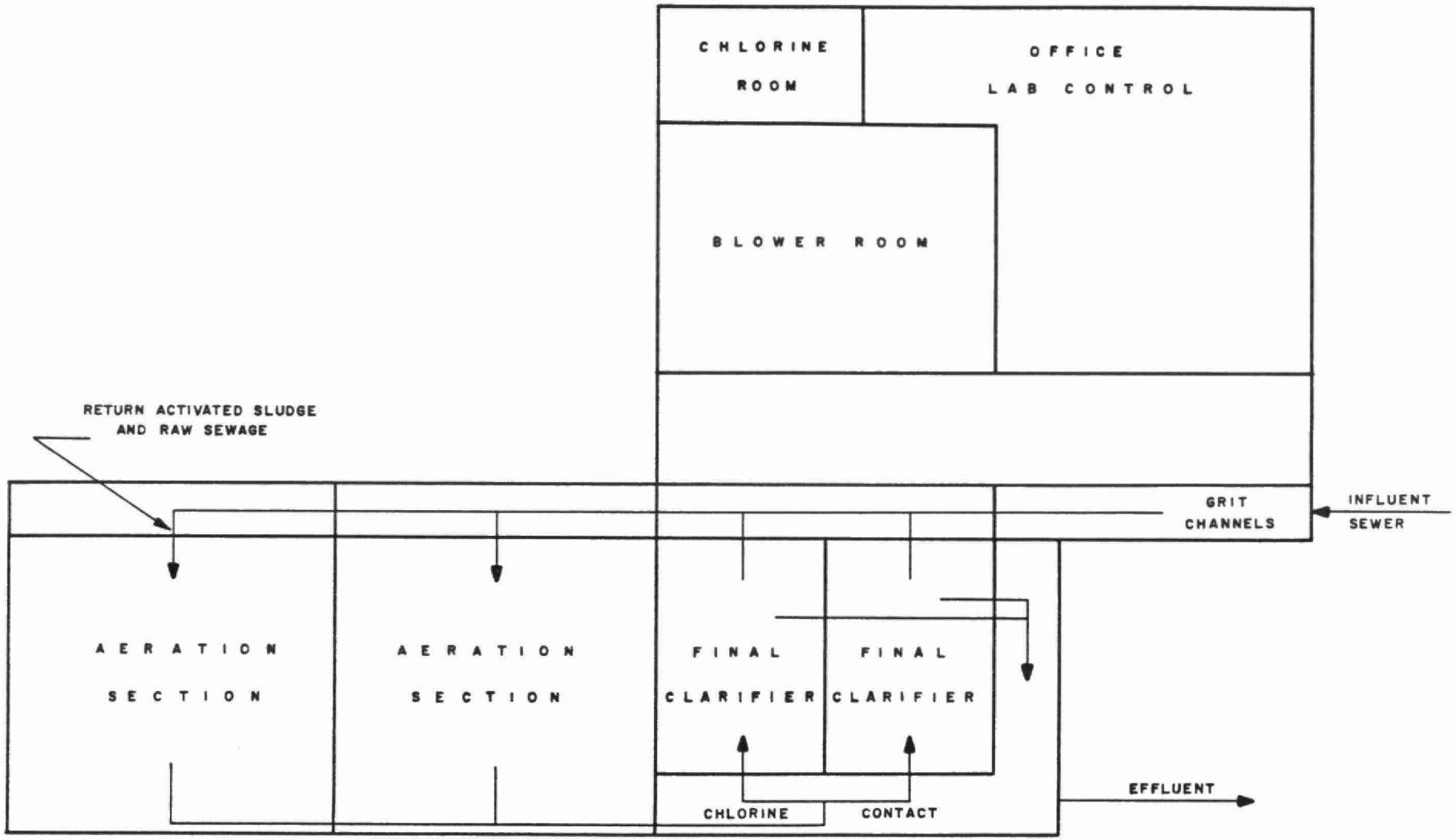
Project Staff

Chief Operator: N. C. Tilker

COMMENTS

The plant was staffed 36 hours during week days and two hours each on Saturday and Sunday for a total of 40 hours. During this period the Chief Operator also performed related duties for the Village.

The Chief Operator has successfully completed the Junior and Intermediate sewage operators' courses in Toronto sponsored by the OWRC. The senior operators' course which qualifies an operator for a Certificate of Qualification as a Sewage Works Operator on successful completion will be conducted in the spring of 1966.



ELORA W P C P
FLOW CHART

Description of Project

INFLUENT WORKS

Sewage is pumped to the plant from a pumping station where screening is provided. The sewage enters the plant via a trunk sewer and passes through a grit channel.

The flow of sewage through the plant is by gravity.

AERATION

From the grit channels, the raw sewage passes to two aeration tanks, each 20' wide x 32' long x 11' deep, where it is mixed with air and biologically activated sludge. The mixed liquor is retained in the aeration tanks for a period of approximately 25 hours. The process that the sewage undergoes is termed 'total oxidation". Air is supplied to the tanks by two variable speed pulley driven air blowers.

Waste activated sludge is stored in a holding tank and is hauled from the plant by tank truck.

FINAL CLARIFIERS

Two tanks 6' wide x 26' long x 7' - 9" deep receive flow from the aeration section. The activated sludge settles to the tank bottom where it is collected by a longitudinal scraper mechanism. This sludge is returned to the aeration section. The clear liquid remaining in the clarifiers overflows weir plates and is directed to the chlorine contact chamber.

CHLORINE CONTACT CHAMBER

The chlorine contact chamber is 5' wide x 13' long x 6' deep and provides a detention time of approximately 37 minutes at the design flow. Chlorine is fed to this tank by a chlorinator located in the office and control building. The effluent from this contact chamber is then directed through a 12" diameter pipe to the Grand River.

PROJECT COSTS

NET CAPITAL COST (Estimated)		$361,945.68
DEDUCT - Portion Financed by CMHC (Estimated)	$122,424.66	
- Payments from Municipalities	41,231.20	163,655.86
Long Term Debt to OWRC		$198,289.82
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1965		$ 6,532.34
Net Operating		$ 6,679.39
Debt Retirement		5,090.00
Reserve		2,326.00
Interest Charged		15,867.37
TOTAL		$ 29,962.76

RESERVE ACCOUNT

Balance at January 1, 1965	$ 671.00
Deposited by Municipality	2,326.00
Interest Earned	86.52
	$ 3,083.52
Less Expenditures	-
Balance at December 31, 1965	$ 3,083.52

MONTHLY OPERATING COSTS

MONTH	TOTAL EXPENDITURE	PAYROLL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	* SUNDRY
JAN	432.01	292.22	92.32		25.03	13.75		8.69
FEB	413.62	292.22	92.44		15.92			13.04
MARCH	442.52	292.22	103.22		37.14			9.94
APRIL	596.96	337.59	98.70	115.88	30.00		6.15	8.64
MAY	778.14	474.75	90.70	109.86	50.50			52.33
JUNE	528.59	316.50	84.53		38.02			89.54
JULY	456.55	316.50	86.42		28.99	3.55		21.09
AUG	596.06	316.50	76.79		72.72			130.05
SEPT	431.97	316.50	73.07		31.31			11.09
OCT	586.41	474.75	72.71		30.71			
NOV	434.67	325.22	81.98		15.53			11.94
DEC	981.89	320.86	82.38		33.19	404.12	122.11	127.97
TOTAL	6679.39	4075.83	1035.26	225.74	409.06	421.42	128.26	383.82

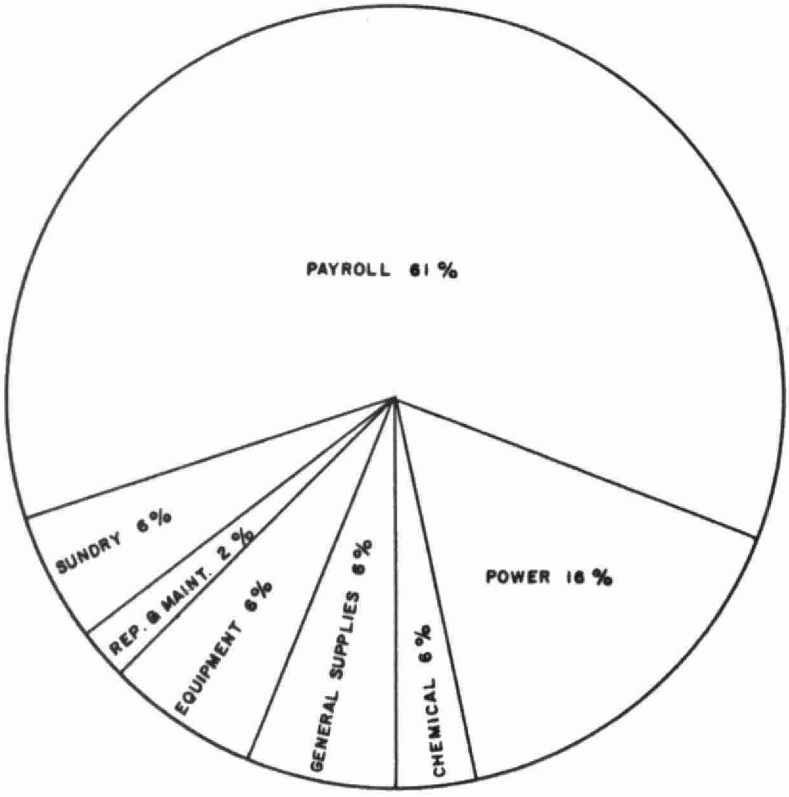
* SUNDRY INCLUDES SLUDGE HAULING COSTS WHICH WERE $23.60

YEARLY OPERATING COSTS

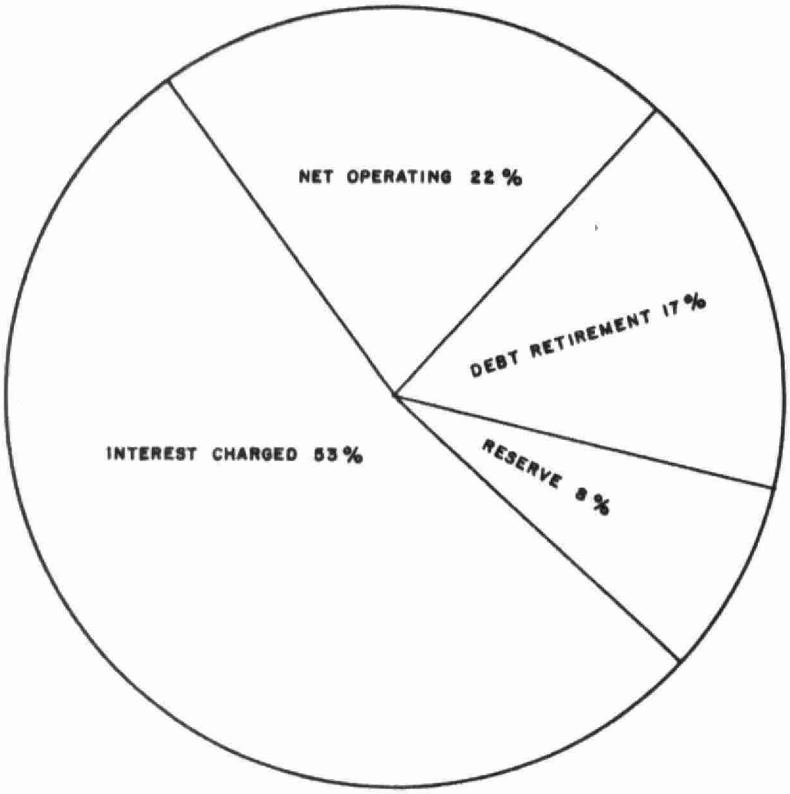
YEAR	M.G. TREATED	TOTAL COST	COST PER FAMILY PER YEAR	COST PER MILLION GALLONS	COST PER L.B. OF BOD REMOVED
1965	13.111	6679.39	* 17.12	509.45	32 CENTS

* BASED ON ANNUAL POPULATION ESTIMATE AND 3.9 PERSONS PER FAMILY

1965 OPERATING COSTS



TOTAL ANNUAL COSTS



Technical Section

Design-Data

GENERAL

Type of Plant - Total Oxidation

Design Population - 1,000 persons

Design Plant Flow - 83,000 gpd

Per Capita Flow - 83 gpd

Five Day BOD -

Raw Sewage - 210 ppm

Suspended Solids -

Raw Sewage - 250 ppm

PRIMARY TREATMENT

Screening (at pumping station)

2 coarse bar screens.

Grit Removal

10 ft. long x 2 ft. wide grit channels (2 channels).

SECONDARY TREATMENT

Aeration Section

Diffused air supplied by 2 variable - speed pulley driven air blowers.

Size of tanks - 20' x 32' x 11'

Volume - 14,100 cu. ft. (2 tanks)

Detention Time - 25 hours.

Final Settling

2 tanks with longitudinal chain scraper mechanism.

Size - 6' wide x 26' long x 7' - 9" deep.

Volume - 7,500 Imperial gallons

Detention time - 4.3 hours @ design flow

Surface Settling Rate - 266 Imperial gallons per sq. ft. of weir per day.

Overflow Rate - 1,500 Imperial gallons per lin. ft. of weir per day.

Chlorine Contact Chamber

Size - 5' wide x 13' long x 6' deep

Volume - 2,180 Imperial gallons.

Detention time - 37.7 minutes @ design flow.

Sludge Holding Tank

Size - 20' x 8" x 27' - 0" x 11' - 9" average depth.

Volume - 6,750 cu. ft.

Process Data

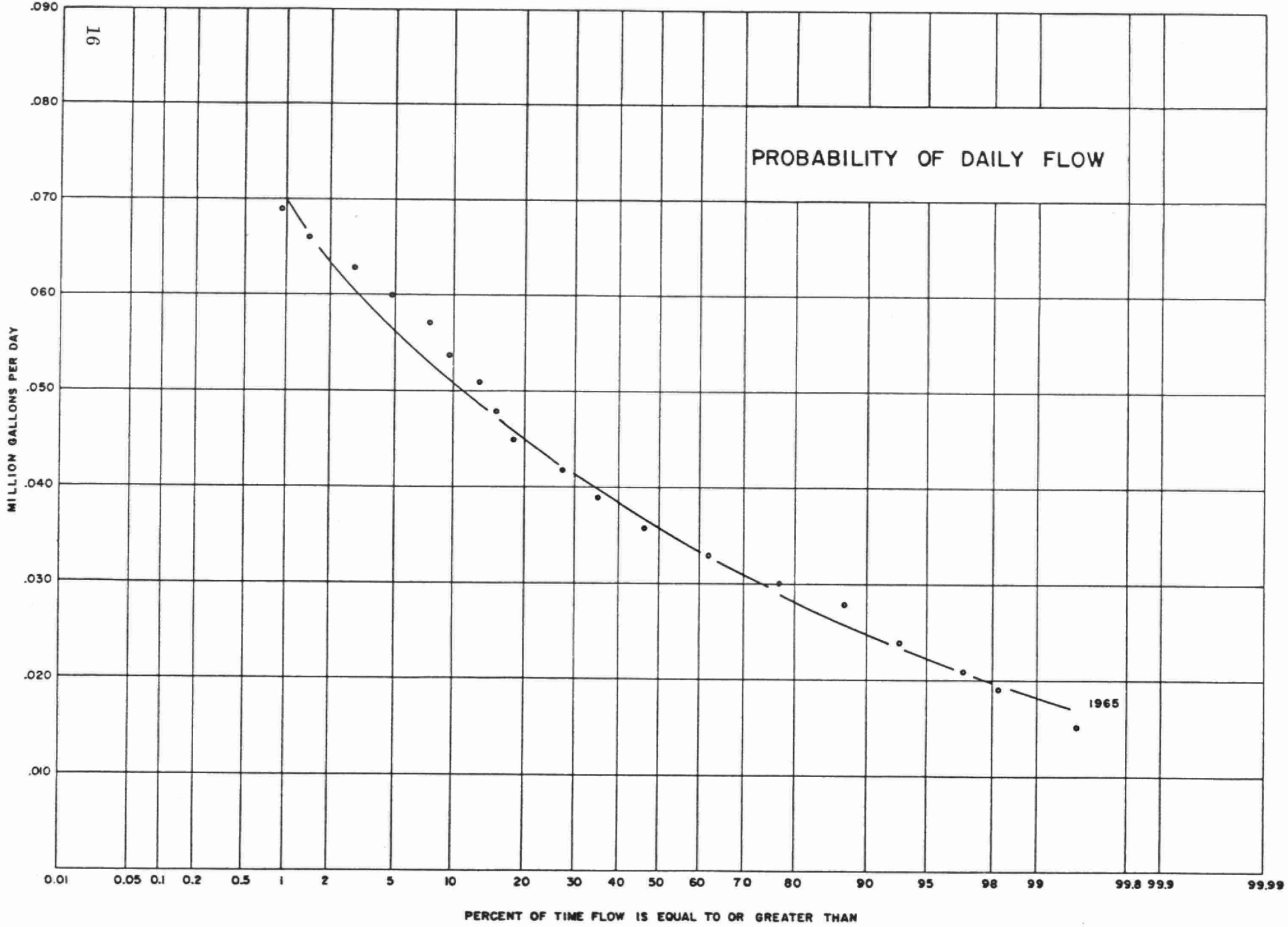
FLOWS

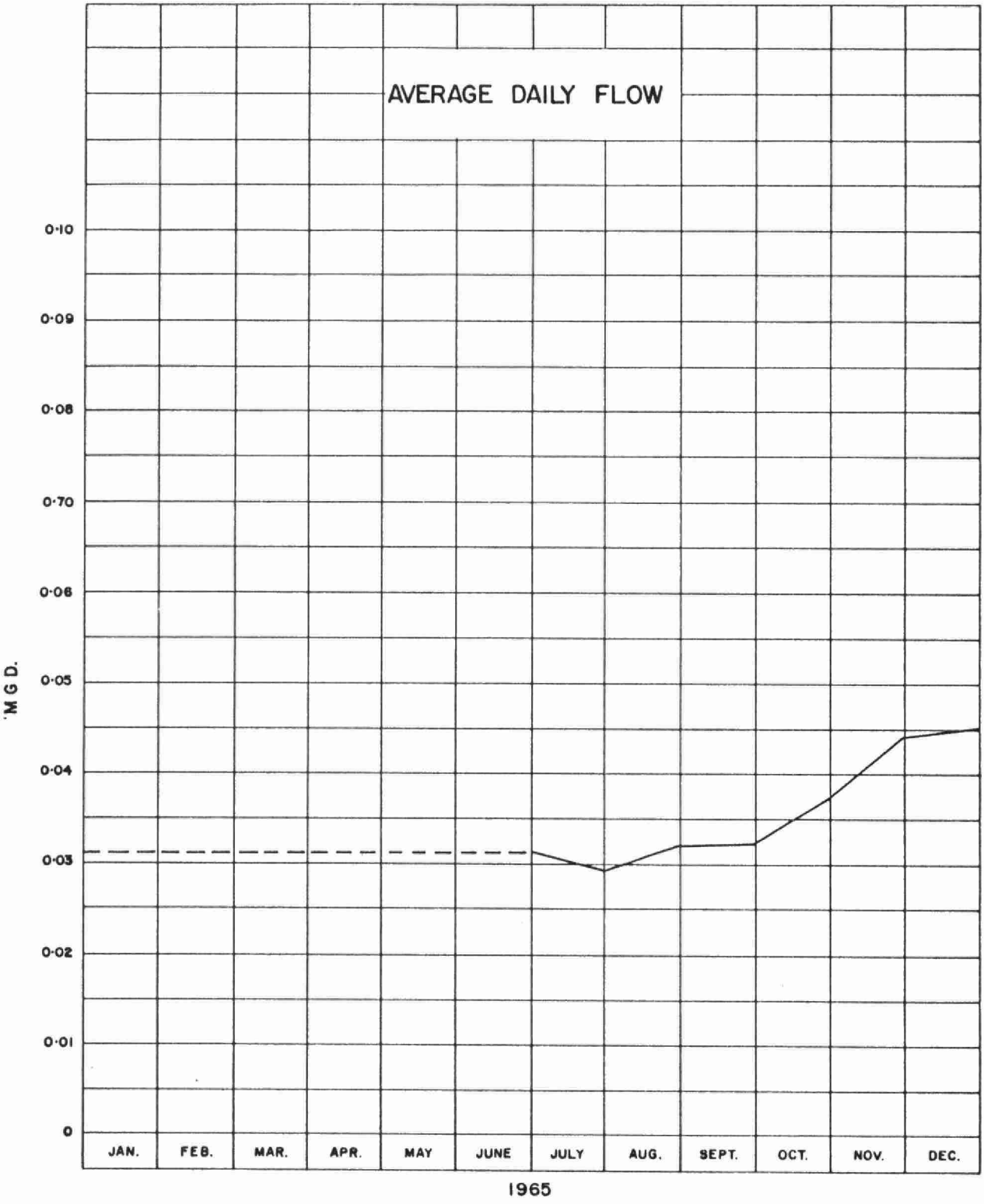
There were no flow results for the period from January to May. This was due to the fact that the metering facilities were inoperative during that period. Also, it can be seen that the recorded flows during the balance of the year were much below the design flow of 83,300.

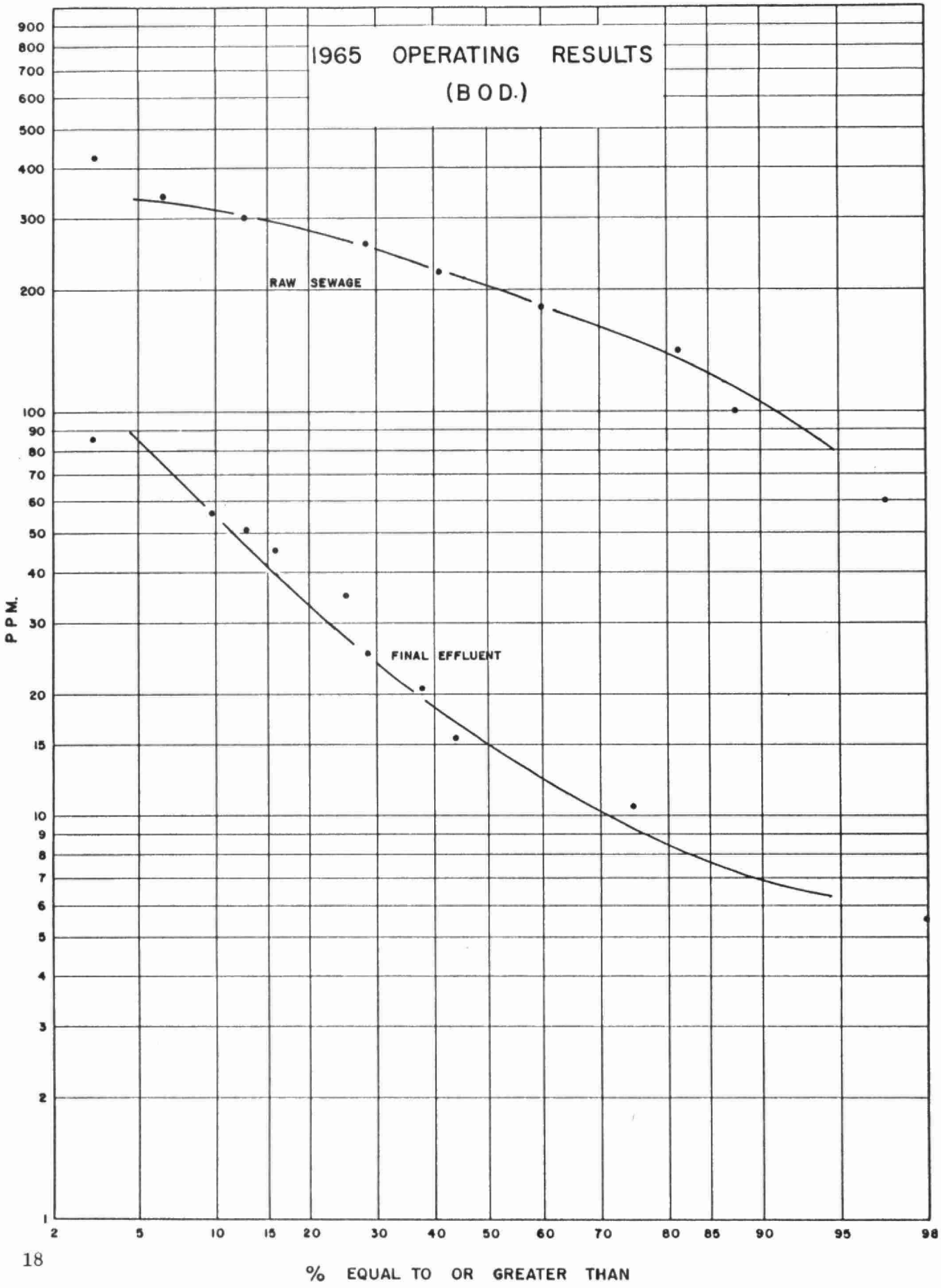
From the graph showing the daily flow probability, it can be seen that more than 99% of the time the flows were less than design flow, and that one-half the design flow was exceeded 27% of the time. The estimated average daily flow for 1965 was 36,000 gallons.

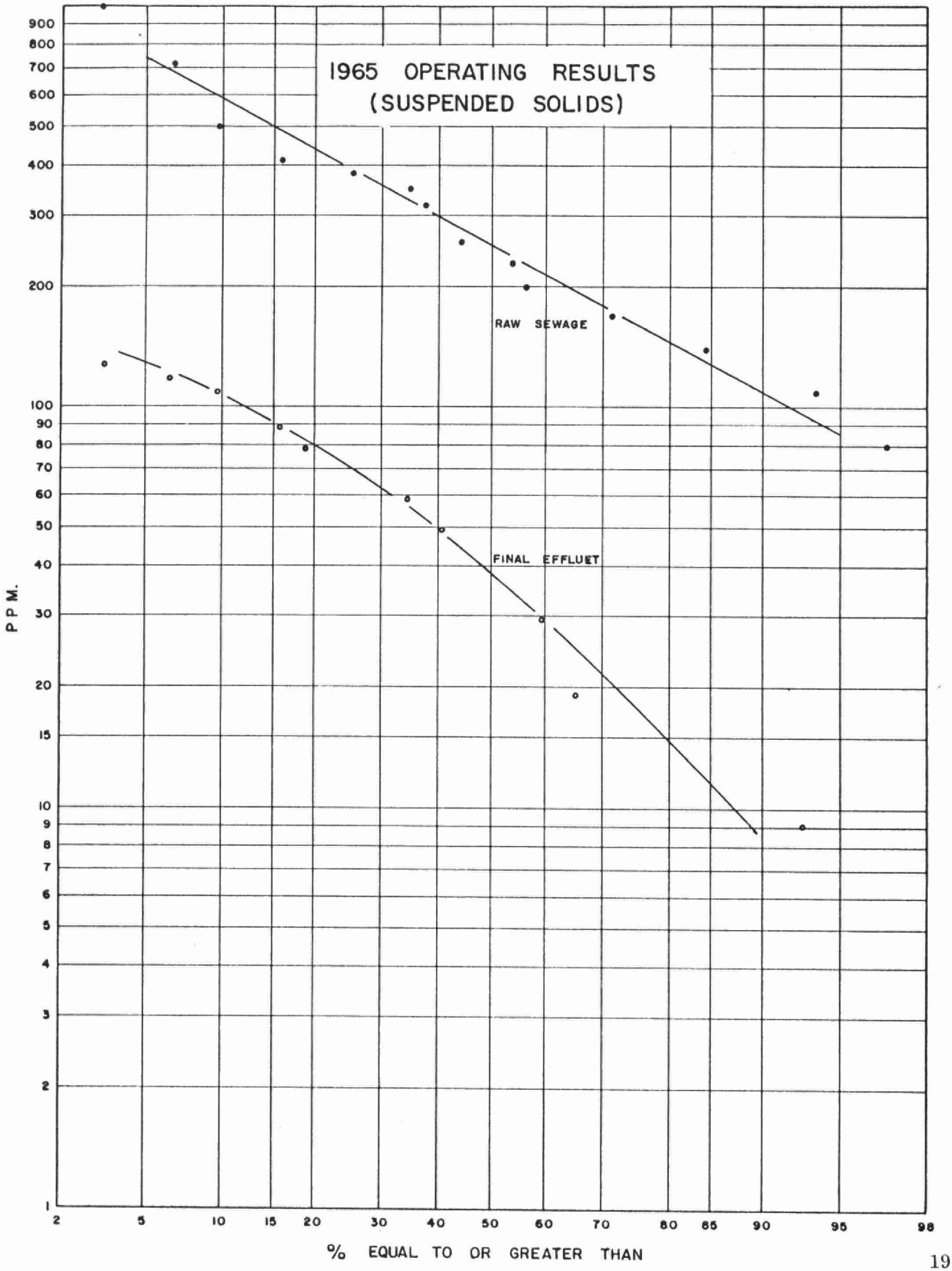
BOD and SUSPENDED SOLIDS

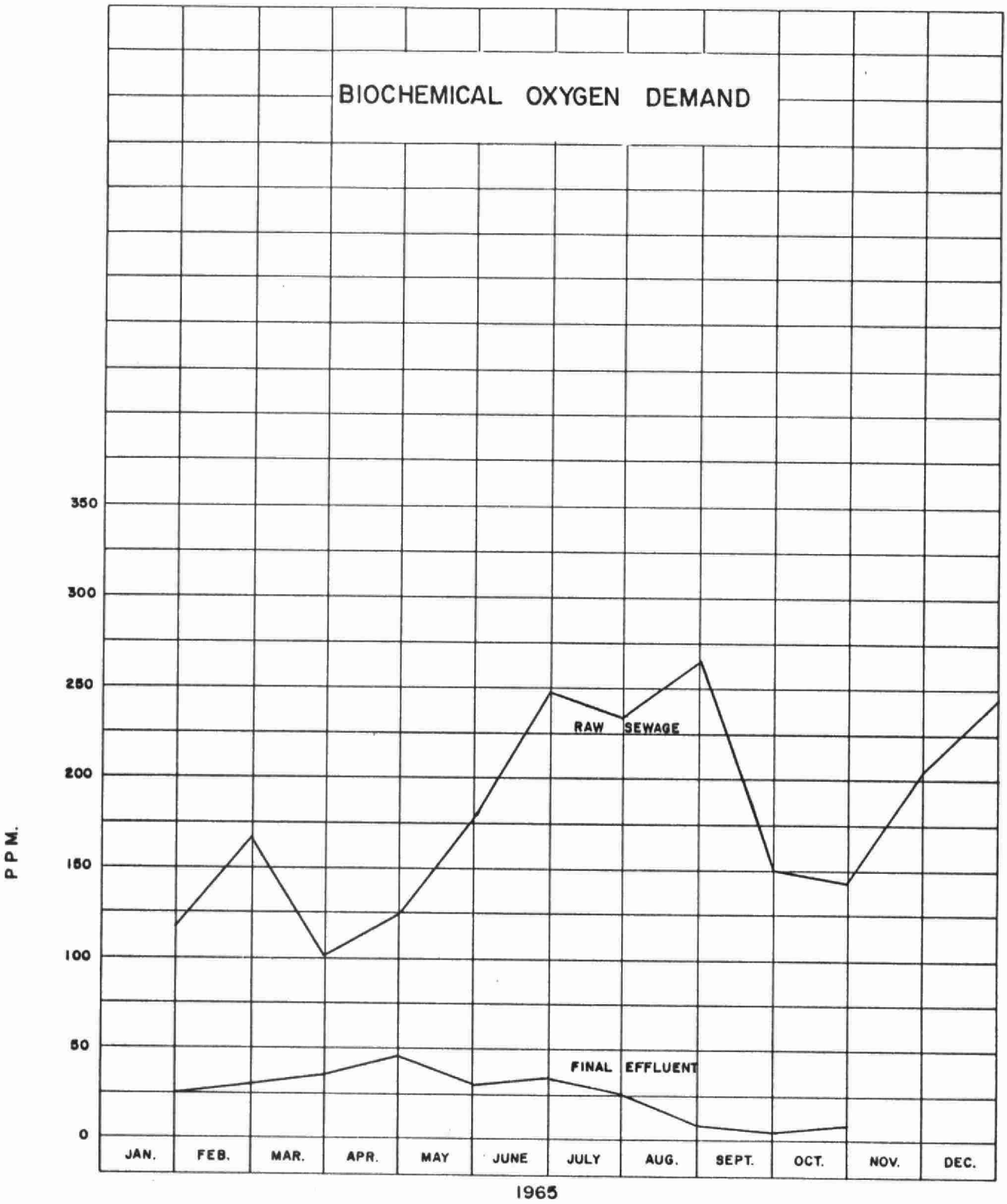
The probability graphs of BOD and suspended solids indicate that during 1965 the design raw sewage BOD and suspended solids concentrations of 210 ppm and 250 ppm were exceeded 47% and 50% of the time respectively. It can also be noted from the graphs that the final effluent BOD and suspended solids concentrations exceeded the OWRC objective of 15 ppm 49% and 80% of the time respectively. These results further reflect the inefficient treatment experienced during the start-up and stabilization period at the beginning of 1965.

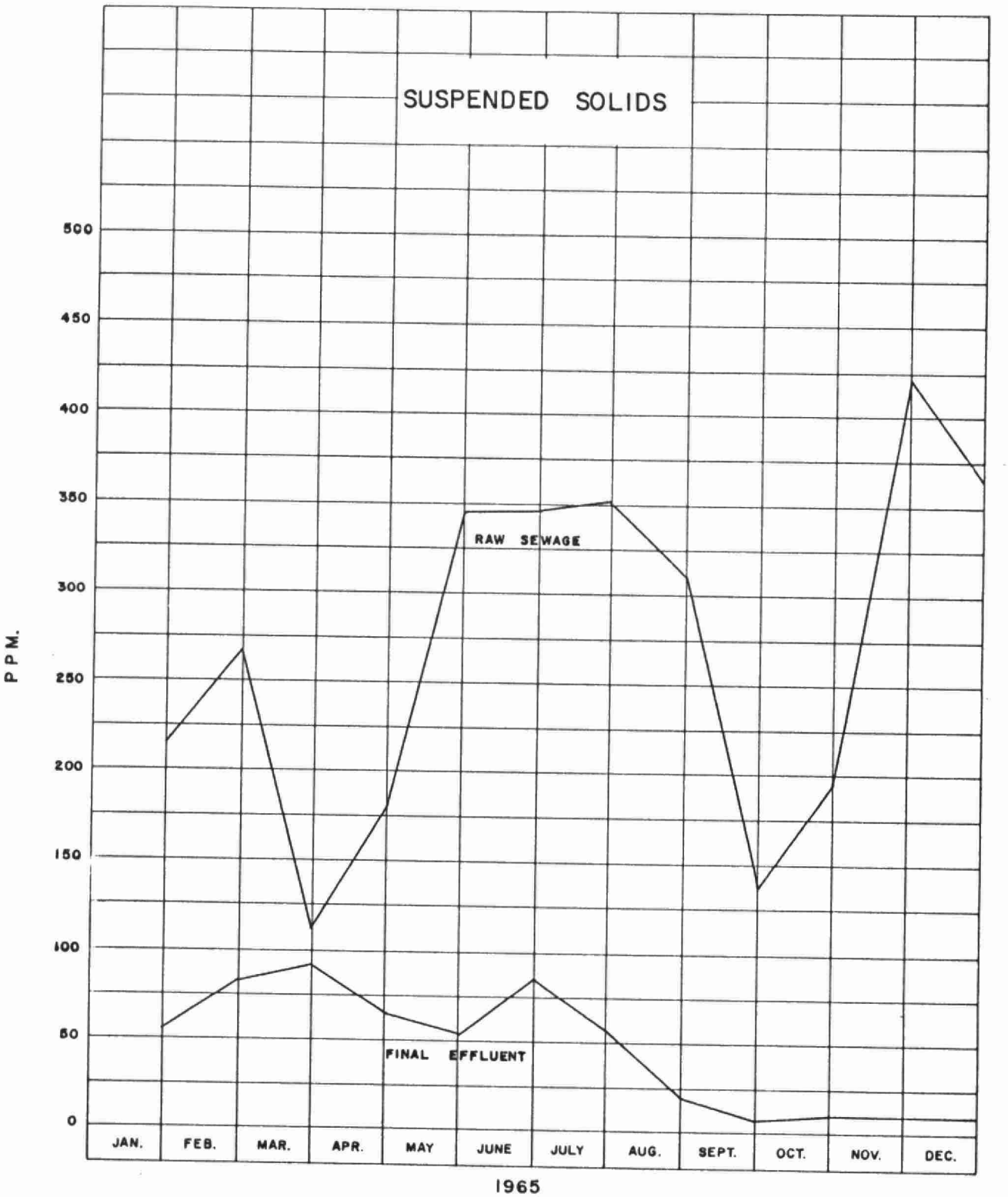

PROBABILITY OF DAILY FLOW
MILLION GALLONS PER DAY
.090
.080
.070
060
.050
.040
.030
.020
.010
1965
0.01
0.05
0.1
0.2
0.5
1
2
5
10
20
30
40
50
60
70
80
90
95
98
99
99.8
99.9
99.99
PERCENT OF TIME FLOW IS EQUAL TO OR GREATER THAN


AVERAGE DAILY FLOW
0·10
0·09
0·08
0·70
0·06
0·05
0·04
0·03
0·02
0·01
0
M G D.
JAN.
FEB.
MAR.
APR.
MAY
JUNE
JULY
AUG.
SEPT.
OCT.
NOV.
DEC.
1965


1965 OPERATING RESULTS
(B O D.)
RAW SEWAGE
FINAL EFFLUENT
P P M.
900
800
700
600
500
400
300
200
100
90
80
70
60
50
40
30
20
15
10
9
8
7
6
5
4
3
2
1
2
5
10
15
20
30
40
50
60
70
80
85
90
95
98
% EQUAL TO OR GREATER THAN


1965 OPERATING RESULTS
(SUSPENDED SOLIDS)
RAW SEWAGE
FINAL EFFLUET
P P M.
900
800
700
600
500
400
300
200
100
90
80
70
60
50
40
30
20
15
10
9
8
7
6
5
4
3
2
1
2
5
10
15
20
30
40
50
60
70
80
85
90
95
98
% EQUAL TO OR GREATER THAN


BIOCHEMICAL OXYGEN DEMAND
PPM.
350
300
250
200
150
100
50
0
RAW SEWAGE
FINAL EFFLUENT
JAN.
FEB.
MAR.
APR.
MAY
JUNE
JULY
AUG.
SEPT.
OCT.
NOV.
DEC.
1965


SUSPENDED SOLIDS
RAW SEWAGE
FINAL EFFLUENT
P P M.
500
450
400
350
300
250
200
150
100
50
0
JAN.
FEB.
MAR.
APR.
MAY
JUNE
JULY
AUG.
SEPT.
OCT.
NOV.
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GRIT, B.O.D AND S.S. REMOVAL

MONTH	B. O. D.				S. S.				GRIT REMOVAL CU. FT.
	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	
JAN.	130	23	82.5	*	214	54	74.5	*	
FEB.	165	30	82.0	*	266	79	70.5	*	
MAR.	100	33	67.0	*	111	89	20.0	*	
APR.	123	45	63.5	*	179	62	65.5	*	
MAY	178	28	84.0	*	343	52	85.0	*	
JUNE	248	34	86.0	1.0	344	81	76.5	1.2	
JULY	233	26	89.0	0.9	350	56	84.0	1.3	
AUG.	264	8	97.0	1.3	310	19	94.0	1.4	
SEPT.	151	4.9	96.5	0.7	136	7	95.0	0.6	
OCT.	143	6.8	95.0	0.8	195	10	95.0	1.1	
NOV.	204	10	95.0	1.3	422	10	97.5	2.7	
DEC.	245	8	96.5	1.6	362	8	97.5	2.4	
TOTAL	-	-	-	*10.5	-	-	-	*14.8	
AVG.	182	21	88.5	0.9	269	44	83.5	1.2	

* Metering facilities not functioning January - May. Total based on prorated yearly flow of 13.111 million gallons.

COMMENTS

The average raw sewage BOD and suspended solids concentrations of 182 ppm and 269 ppm varied from the design values of 210 ppm and 250 ppm respectively. The average effluent BOD and suspended solids concentrations of 21 ppm and 44 ppm respectively exceeded the OWRC objective of 15 ppm for each. It can be seen from the table that during the beginning of the year, due to the start up and stabilization period, the treatment efficiency was not up to OWRC standards. However, during the latter part of 1965, there was a marked improvement in the treatment efficiency as reflected in the percent reduction of the BOD and suspended solids concentrations.

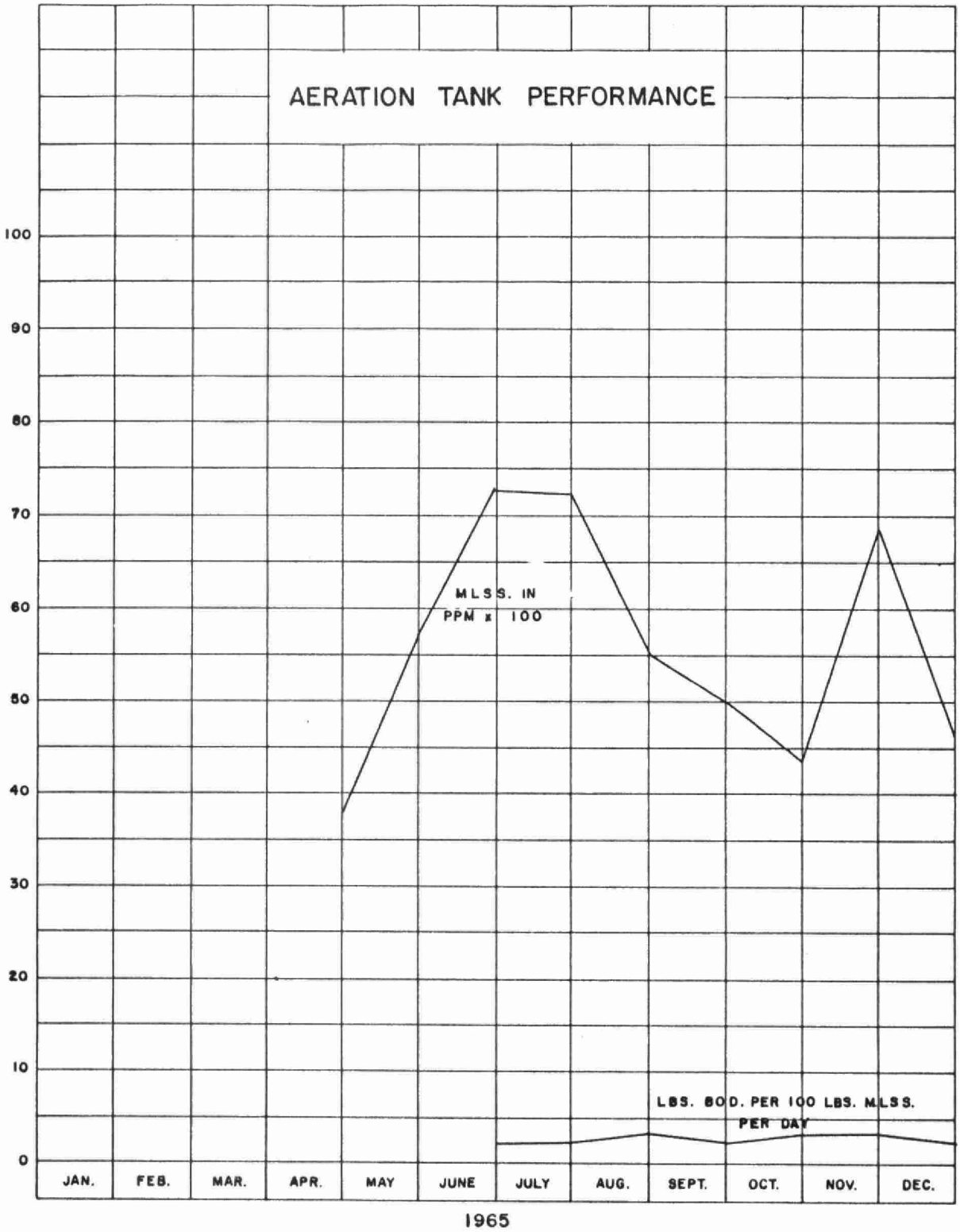
CHLORINATION

MONTH	PLANT FLOW (MG)	POUNDS CHLORINE	DOSAGE RATE (P.P.M)
JANUARY	* -	35	-
FEBRUARY	* -	32	-
MARCH	* -	31	-
APRIL	* -	30	-
MAY	* -	72	-
JUNE	.940	45	4.79
JULY	.897	31	3.46
AUGUST	.998	31	3.11
SEPTEMBER	.962	30	3.12
OCTOBER	1.169	31	2.65
NOVEMBER	1.327	30	2.26
DECEMBER	1.382	31	2.24
TOTAL	**13.111	429	-
AVERAGE	1.093	36	3.27

* Metering facilities not functioning.
** Total prorated on June-December flows

COMMENTS

An average dosage rate of 3.27 ppm of chlorine was required in 1965 to give a residual of 0.5 ppm.


AERATION TANK PERFORMANCE
100
90
80
70
60
50
40
30
20
10
0
MLSS. IN
PPM x 100
LBS. BOD. PER 100 LBS. MLSS.
PER DAY
JAN.
FEB.
MAR.
APR.
MAY
JUNE
JULY
AUG.
SEPT.
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AERATION SECTION

MONTH	PRIM. EFFL B.O.D. P.P.M.	M.L.S.S. P.P.M.	LBS. BOD. PER 100 LBS. M. L. S. S.	CUBIC FEET AIR PER LB. B.O.D. REMOVED
JANUARY	130	–	–	–
FEBRUARY	165	–	–	–
MARCH	100	–	–	–
APRIL	123	3678	–	–
MAY	178	5590	–	–
JUNE	248	7250	2	5790
JULY	233	7200	2	5695
AUGUST	264	5514	3	3816
SEPTEMBER	151	5027	2	6957
OCTOBER	143	4351	3	6963
NOVEMBER	204	6833	3	5169
DECEMBER	245	4559	2	4208
TOTAL	–	–	–	–
AVERAGE	182	5556	2	5514

COMMENTS

The average aeration tank loading of 2 lbs. BOD per 100 lbs. MLSS is within the recommended range of loading for an extended aeration process of 1 to 5 lbs. of BOD per 100 lbs. MLSS.

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CONCLUSIONS

The average BOD and suspended solids removals were 89 percent and 84 percent respectively. During the early part of the year difficulties were experienced in the plant start-up and stabilization period. These difficulties accounted for lower than expected BOD and suspended solids removal efficiencies. However, during the later part of the year, the average BOD and suspended solids removal efficiencies were greater than 90 percent.

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Elora water
pollution control plant: asvr
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